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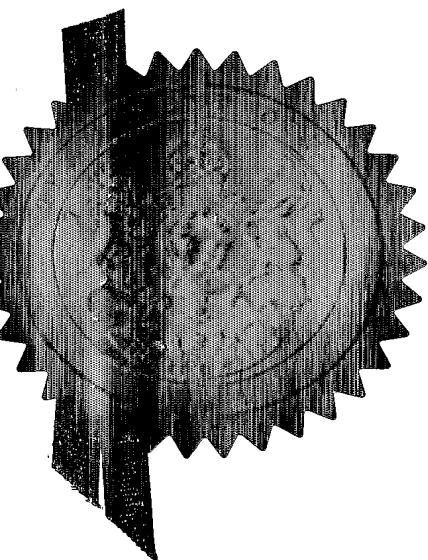
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P.7280 GBA

2. Patent application number  
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0329802.3

3. Full name, address and postcode of the or of  
each applicant (underline all surnames)HOWES, Jonathan Sebastian  
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Cowfold Road  
Bolney  
West Sussex RH17 5QU  
G.B.MACNAGHTEN, James  
Fernleigh Cottage  
3 Hill Avenue  
Cambridge CB1 7UY  
G.B.

Patents ADP number (if you know it)

If the applicant is a corporate body, give the  
country/state of its incorporation

08329757001. 08778045001

## 4. Title of the invention

SAILING VESSEL

## 5. Name of your agent (if you have one)

"Address for service" in the United Kingdom  
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(including the postcode)MAGUIRE BOSS  
5 Crown Street  
St. Ives  
Cambridgeshire  
PE27 5EB, G.B.

Patents ADP number (if you know it)

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Country

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Claims(s)

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(please specify)

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Maguire Boss

MAGUIRE BOSS

Date: 23.12.03

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

P.J. EVENS

Tel: 01480 301588

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TITLE: SAILING VESSEL

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DESCRIPTION

The present invention relates generally to a sailing vessel, and more specifically to a sailing vessel comprising a novel keel.

Fin keels (e.g. comprising a single fin supporting a ballast bulb) are well known in the art as a means of providing lateral stability to conventional sailing vessels. However, there are a number of problems associated with fin keels. For example, fin keels are structurally vulnerable to impacts and dynamic loads, with flexure of a fin keel having the potential to cause substantial damage thereto, particularly if cyclically applied loads (e.g. due to waves) are close to the natural frequency of the keel. Furthermore, efficient fin keels require a deep draught to ensure an adequate lifting efficiency. High aspect ratio fins suffer from a low stalling angle which can lead to control problems in rough

conditions, and in the worst cases can lead to regular loss of control of a vessel. In contrast, shorter (i.e. shallow draught) keels may be strong, but deliver poor upwind performance due to increased vortex drag.

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In accordance with the present invention there is  
25 provided a sailing vessel comprising a hull means and a keel comprising a member depending from the hull means, characterised in that the member comprises two limbs each depending from a respective lateral side of the hull means,

the two limbs defining at least in part an enclosed flow path extending through the keel in a bow to stern direction, the enclosed flow path being configured for allowing water incident on the keel to flow therethrough when sailing the sailing vessel.

In this way, a keel with an enclosed flow path (or "loop keel" defining a "loop") is provided which, when in use, may result in a closed loop of hydrodynamic force, all directed away from the centre of the enclosed closed flow path. This situation is analogous to a vortex ring in a continuous flow and, unless an overall lateral force is being generated on the loop keel, should not result in substantial vorticity being shed by the loop keel. The hull means may be a monohull.

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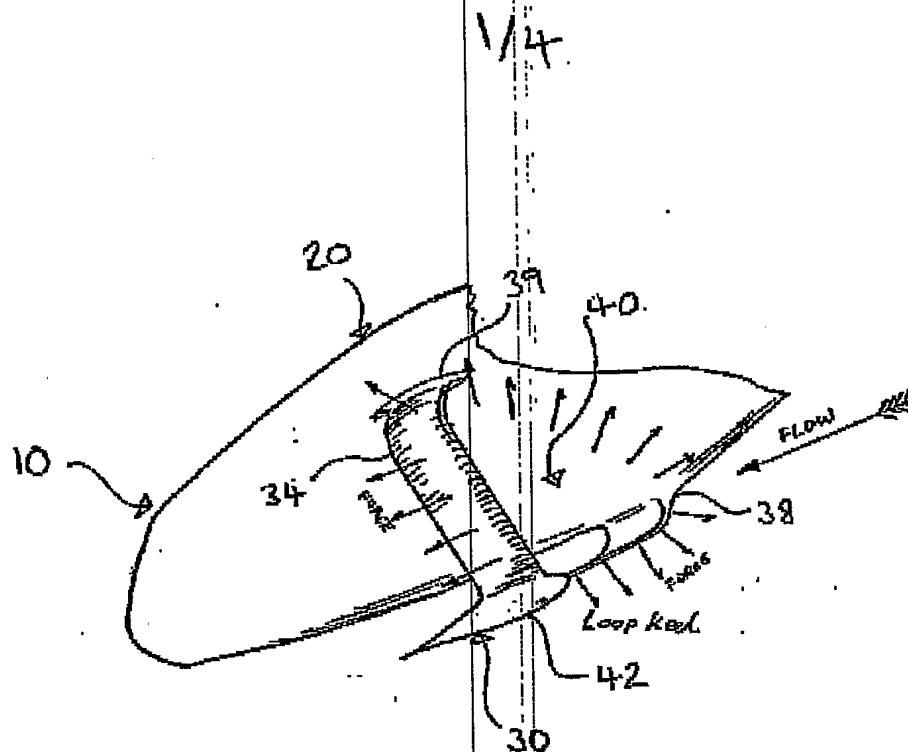
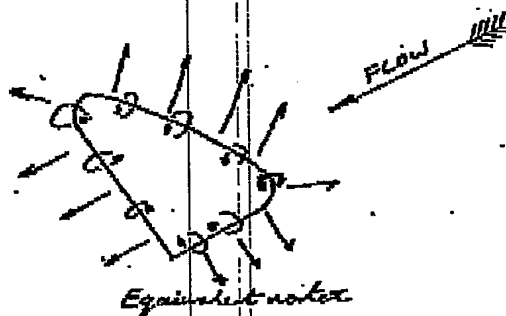
to generate force away from the centre of the loop, it is ideally placed to generate an efficient leeway resisting force, this force is also generated without requiring the hull to crab as with a conventional fixed fin and this can be used to reduce the heeled hull drag. It also has a further advantage over a fin keel in this condition, since the other limb of the keel (the leeward limb) still provides surface continuity and acts in the same manner as an aircraft winglet increasing the effective aspect ratio of the keel and thus reducing the vortex drag. The leeward limb generates a force both downward and to a lesser degree to leeward. The hull, due to the heeling angle, also moves the centre of buoyancy to leeward (form stability) and the force from the leeward keel limb is offset from the centre of buoyancy to weather, this results in a dynamic righting moment. The overall result is that a loop keel equipped yacht should sail to windward with less drag and less heel than a similar yacht equipped with a fin keel.

Yet a further advantage of the loop keel is that the two limbs of the keel will always offer some element of the working keel surface to the water flow at a lateral angle, which will tend to cause a degree of cross flow which has the effect of increasing resistance to stalling. The keel will thus generate lift to high angles of attack and be highly resistant to stall in rough conditions. The loop keel is also of a naturally sturdy and stiff structural form and is very unlikely to suffer from elastically induced dynamic overloads.

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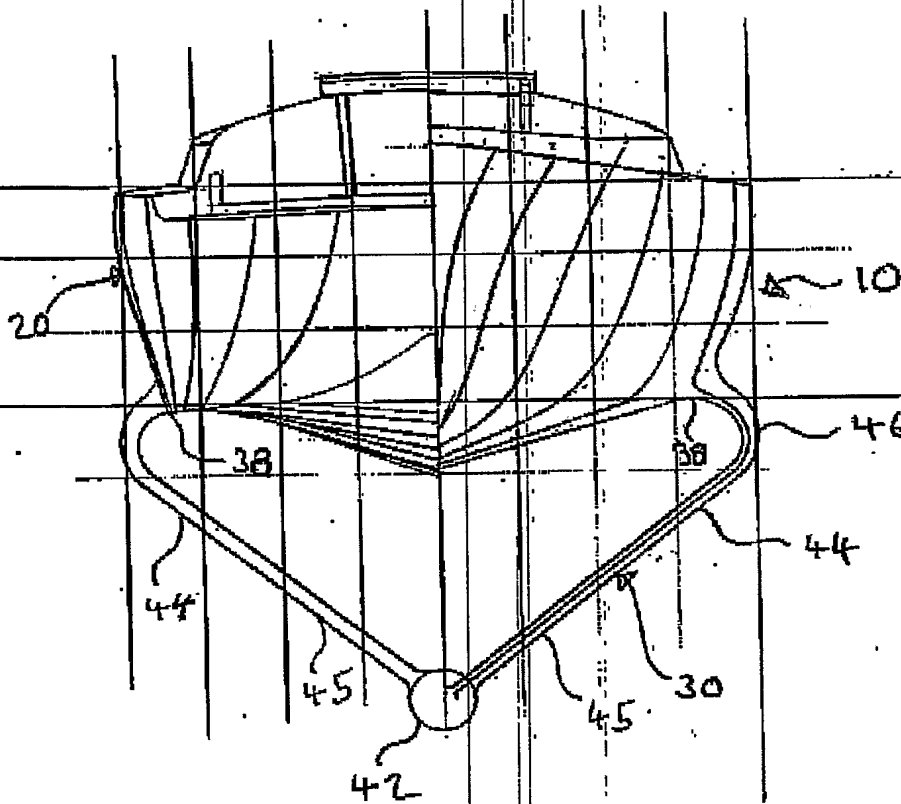
If two otherwise similar sailing vessels are equipped with a fin keel and a competing loop keel of similar draught, the loop keeled vessel will sail downwind with a similar performance to the fin-keeled vessel. However, as soon as the course is such as to place a lateral load on the keel, the loop keeled vessel will sail faster, with less heel and thus a correspondingly more efficient rig, and will be more controllably in extreme conditions. It will also be significantly stronger. If the performance of the two vessels is matched, the loop keeled vessel will have a lower draught than the fin keeled vessel; this reduction in draught is likely to be of the order of 20% to 30%.

15

FIGURE 1FIGURE 2



2/4

FIGURE 3





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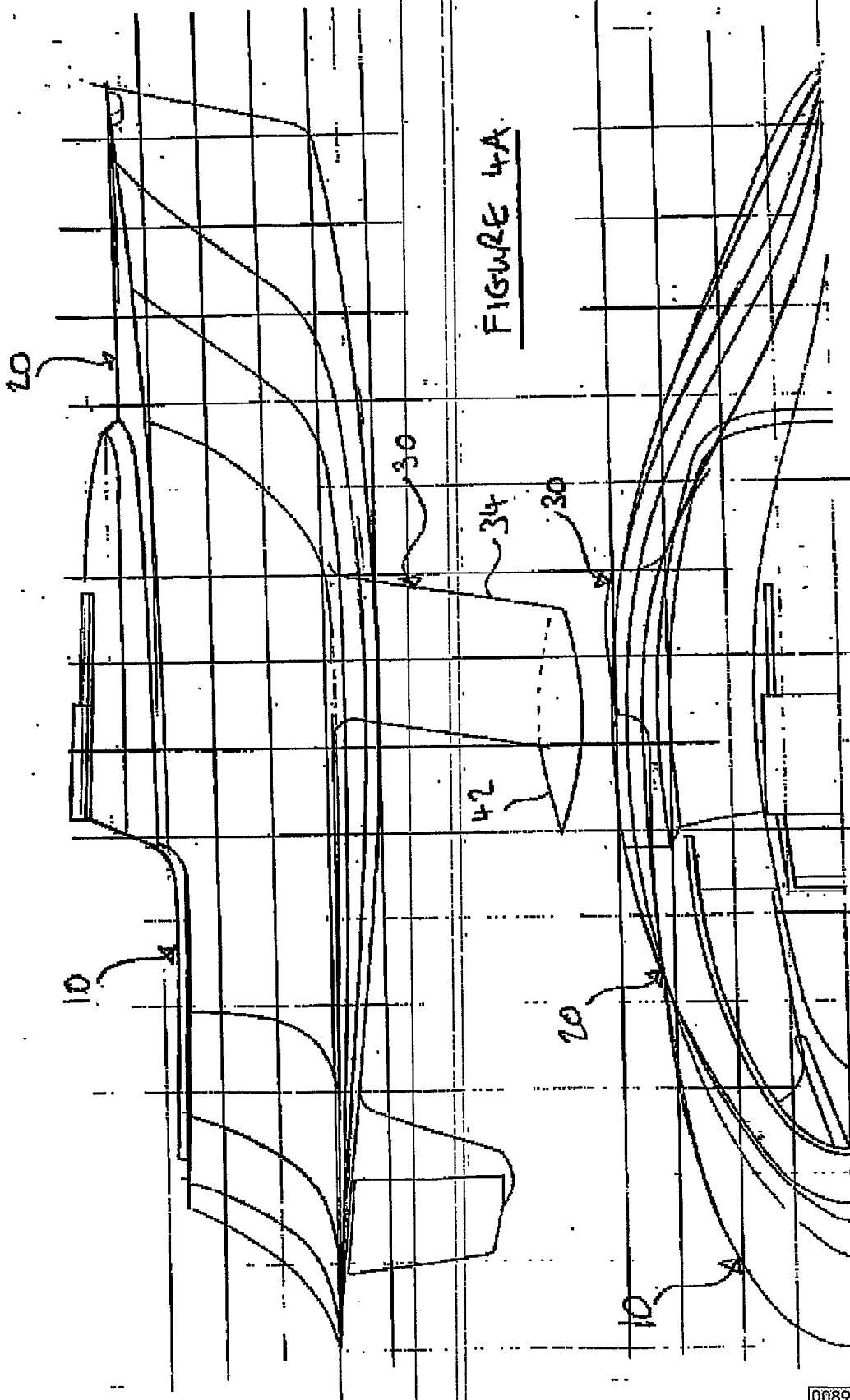


FIGURE 4A

FIGURE 4B



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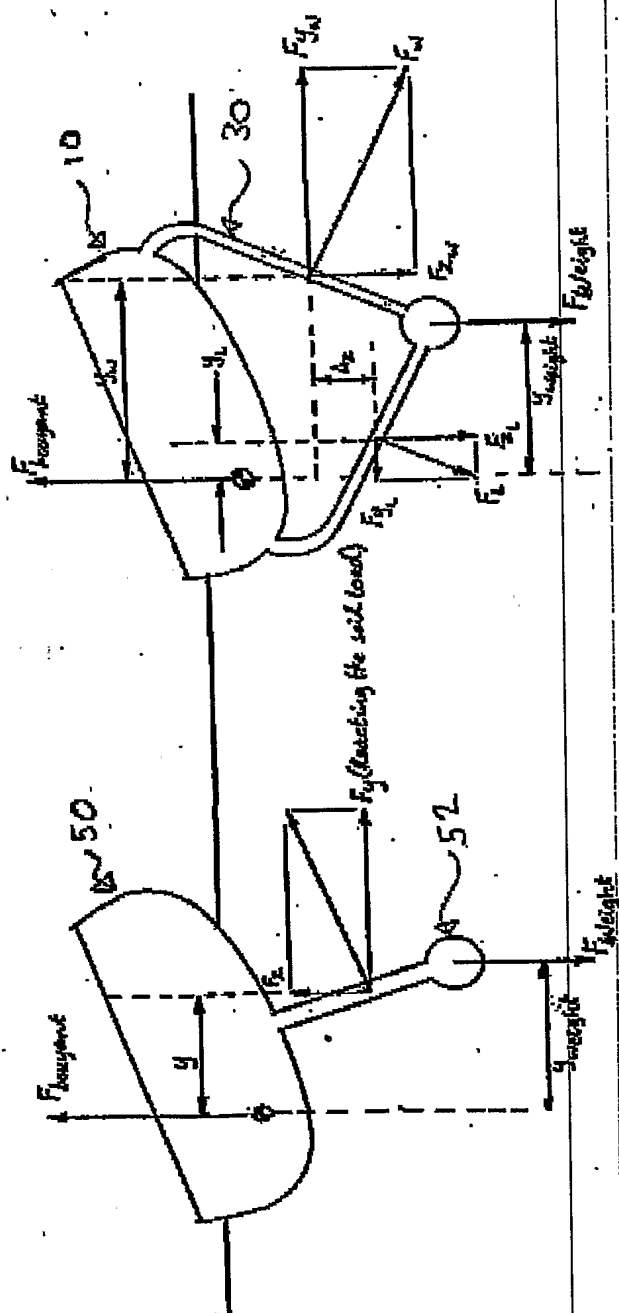
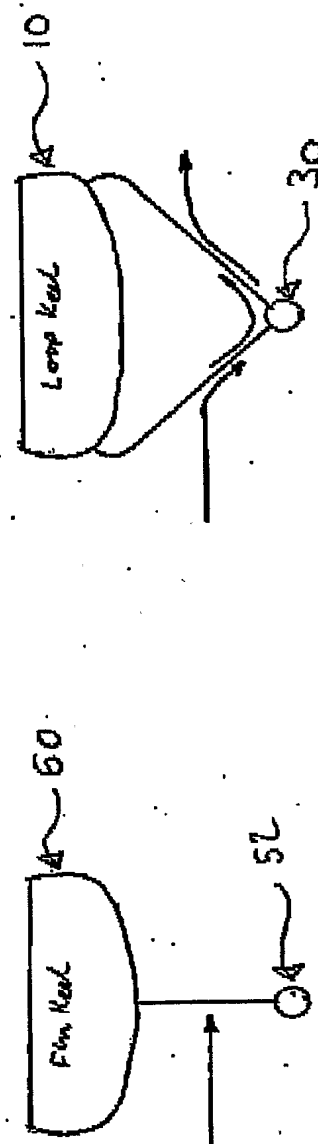


FIGURE 5



100-442621



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P.7280 GBA

2. Patent application number  
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0329802.3

3. Full name, address and postcode of the or of  
each applicant (underline all surnames)HOWES, Jonathan Sebastian  
3 Chapel Cottages  
Cowfold Road  
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West Sussex RH17 5QU  
G.B.MACNAGHTEN, James  
Fernleigh Cottage  
3 Hill Avenue  
Cambridge CB1 7UY  
G.B.

Patents ADP number (if you know it)

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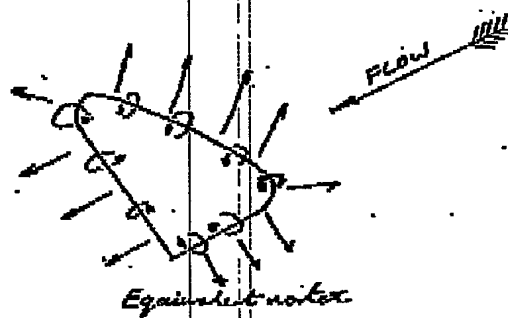
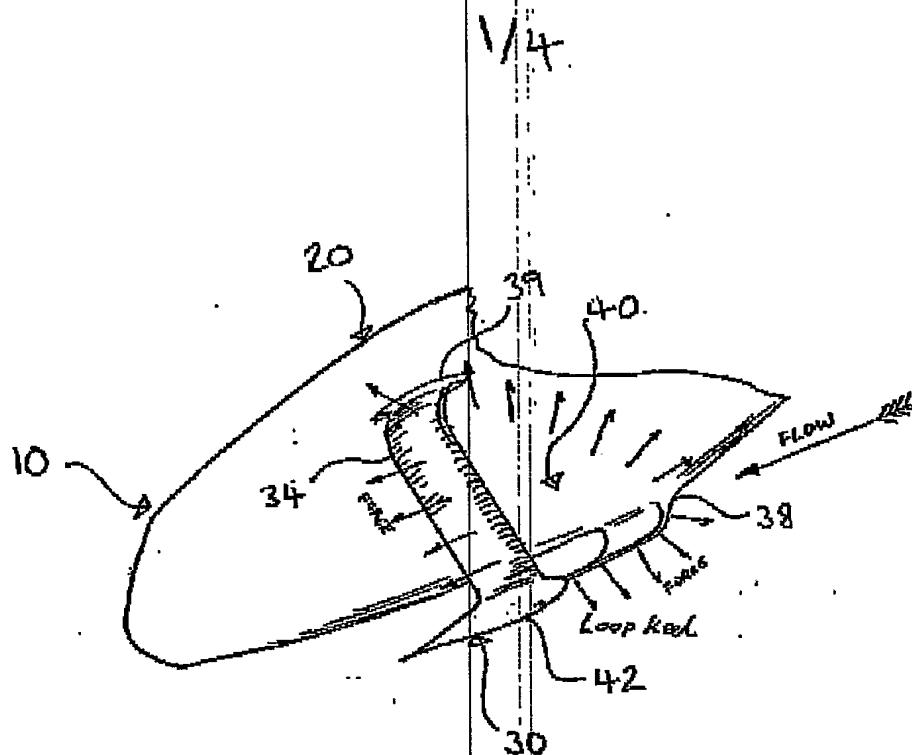
to generate force away from the centre of the loop, it is ideally placed to generate an efficient leeway resisting force, this force is also generated without requiring the hull to crab as with a conventional fixed fin and this can be used to reduce the heeled hull drag. It also has a further advantage over a fin keel in this condition, since the other limb of the keel (the leeward limb) still provides surface continuity and acts in the same manner as an aircraft winglet increasing the effective aspect ratio of the keel and thus reducing the vortex drag. The leeward limb generates a force both downward and to a lesser degree to leeward. The hull, due to the heeling angle, also moves the centre of buoyancy to leeward (form stability) and the force from the leeward keel limb is offset from the centre of buoyancy to weather, this results in a dynamic righting moment. The overall result is that a loop keel equipped yacht should sail to windward with less drag and less heel than a similar yacht equipped with a fin keel.

Yet a further advantage of the loop keel is that the limbs of the keel will always offer some element of the working keel surface to the water flow at a lateral angle, which will tend to cause a degree of cross flow which has the effect of increasing resistance to stalling. The keel will thus generate lift to high angles of attack and be highly resistant to stall in rough conditions. The loop keel is also of a naturally sturdy and stiff structural form and is very unlikely to suffer from elastically induced dynamic overloads.

8

If two otherwise similar sailing vessels are equipped with a fin keel and a competing loop keel of similar draught, the loop keeled vessel will sail downwind with a similar performance to the fin-keeled vessel. However, as soon as the course is such as to place a lateral load on the keel, the loop keeled vessel will sail faster, with less heel and thus a correspondingly more efficient rig, and will be more controllably in extreme conditions. It will also be significantly stronger. If the performance of the two vessels is matched, the loop keeled vessel will have a lower draught than the fin keeled vessel; this reduction in draught is likely to be of the order of 20% to 30%.

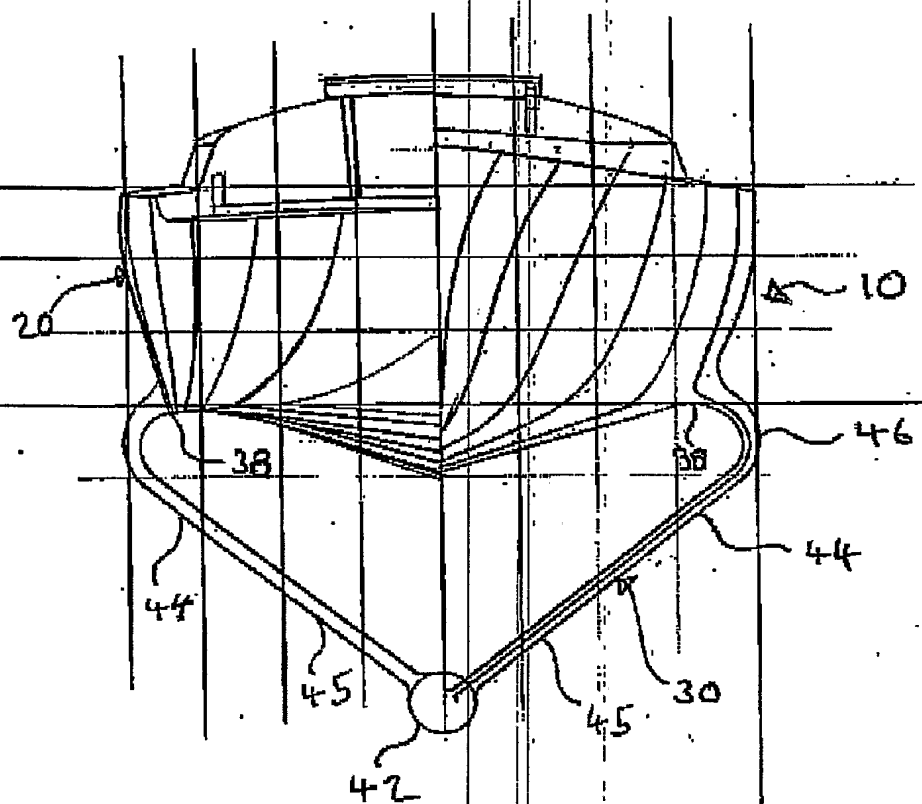
15







2/4

FIGURE 3



3/4

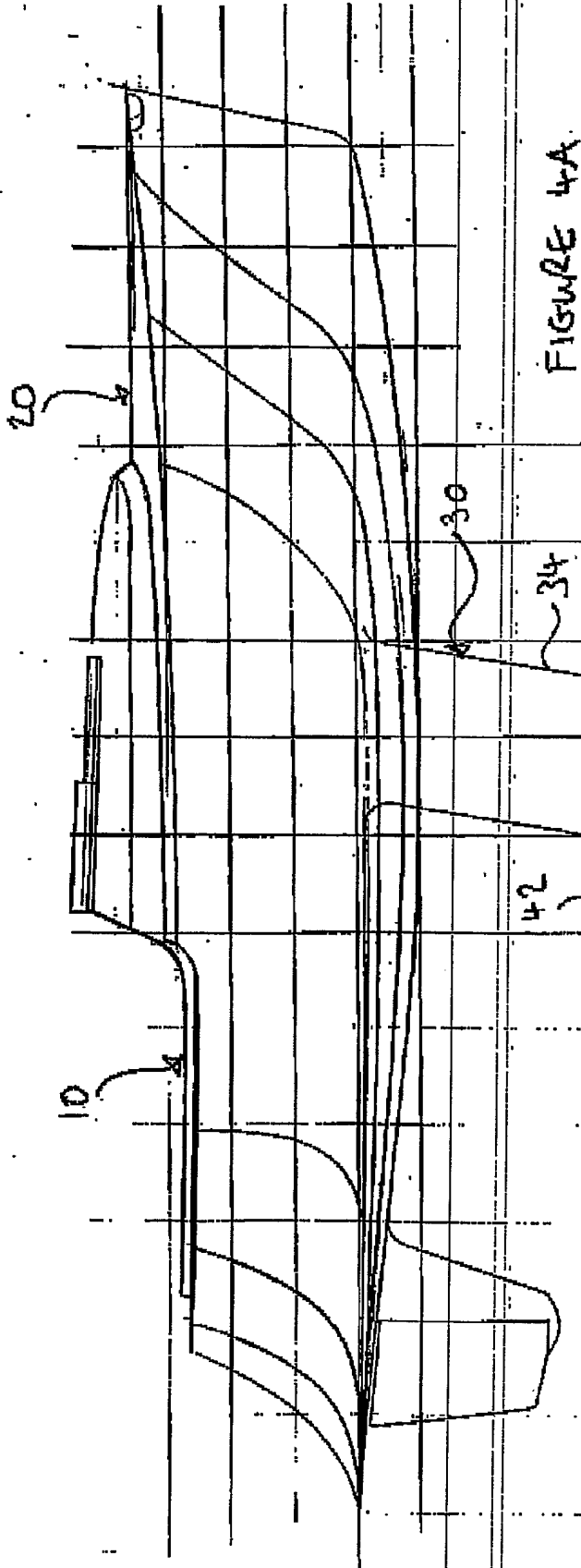


FIGURE 4A

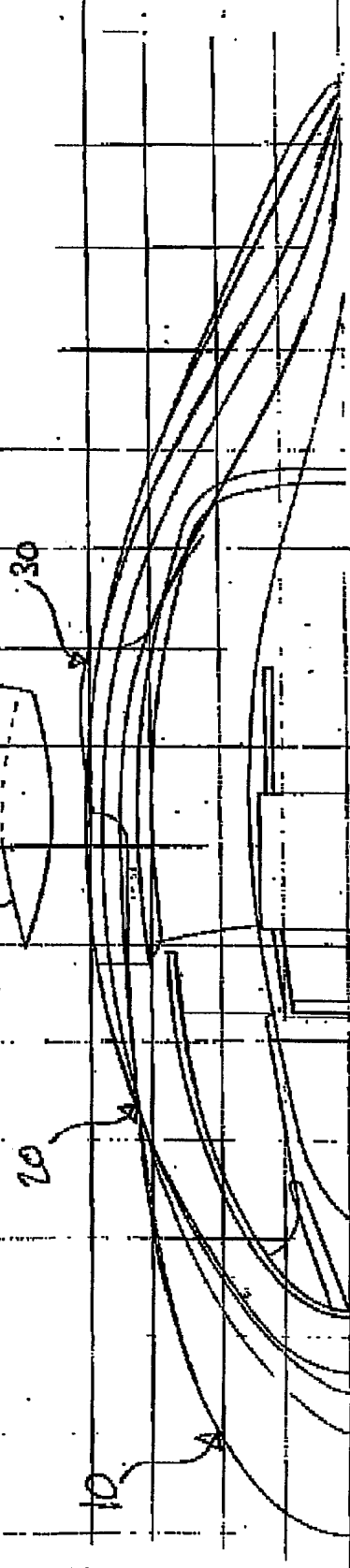


FIGURE 4B





